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| EXAMINER |
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PHAM, THANHHA S

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| ART UNIT | PAPER NUMBER |
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2813

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|--|------------|---------------|
| 3 MONTHS | 01/17/2007 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/815,565

Applicant(s)

SUH ET AL.

Examiner

Thanhha Pham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 27-37 is/are pending in the application.
- 4a) Of the above claim(s) 7,8 and 28-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 9, 27, 31-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This Office Action is in response to Applicant's Amendment dated 10/12/2006.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

- 1. Claims 1-6, 9, 27 and 31-37 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

► With respect to claim 1,

line 3, it is not clear where "the lower surface" comes from. Limitation of "the lower surface" lacking antecedent basis should be changed to "the substrate lower surface" to clarify scope of claim.

line 4, it is not clear where "the stress-relief surface" comes from. Limitation of "the stress-relief layer" lacking antecedent basis should be changed to "the polymer stress-relief layer" to clarify scope of claim.

► With respect to claim 2,

lines 1-2, it is not clear where "the stress-relief surface" comes from. Limitation of "the stress-relief layer" lacking antecedent basis should be changed to "the polymer stress-relief layer" to clarify scope of claim.

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► With respect to claim 3,

line 1, "wherein dispensing a polymer" renders the claim indefinite. It is not clear that "wherein dispensing a polymer" refers to the step of "dispensing the polymer stress-relief layer" as cited in claim 1 or "dispensing a polymer" is another different additional step.

► With respect to claim 6,

line 3, it is not clear where "the lower surface" comes from. Limitation of "the lower surface" lacking antecedent basis should be changed to "the substrate lower surface" to clarify scope of claim.

► With respect to claim 27,

line 3, it is not clear where "the lower surface" comes from. Limitation of "the lower surface" lacking antecedent basis should be changed to "the substrate lower surface" to clarify scope of claim.

line 7, it is not clear where "the stress-relief surface" comes from. Limitation of "the stress-relief layer" lacking antecedent basis should be changed to "the polymer stress-relief layer" to clarify scope of claim.

► With respect to claim 31,

line 4, it is not clear where "the prepolymer" comes from. Limitation of "the prepolymer" lacking antecedent basis should be changed to "the polybenzothiazone prepolymer" to clarify scope of claim.

line 5, "heating the prepolymer to a temperature above the glass transition temperature thereof" renders the claim indefinite. It is not clear that the glass

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transition temperature is the glass transition temperature of which element . It is not clear where "the prepolymer" comes from. Limitation of "the prepolymer" lacking antecedent basis should be changed to "the polybenzothiazone prepolymer" to clarify scope of claim.

► With respect to claim 32,

line 3, it is not clear where "the lower surface" comes from. Limitation of "the lower surface" lacking antecedent basis should be changed to "the substrate lower surface" to clarify scope of claim.

► With respect to claim 33,

lines 2-3, "heating the prepolymer to a temperature above the glass transition temperature thereof" renders the claim indefinite. It is not clear where "the prepolymer" comes from. It is not clear that the glass transition temperature is the glass transition temperature of which element .

► With respect to claim 35,

line 5, it is not clear where "the lower surface" comes from. Limitation of "the lower surface" lacking antecedent basis should be changed to "the substrate lower surface" to clarify scope of claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-6, 27 and 35, as being best understood are rejected under 35

U.S.C. 102(e) as being anticipated by Chason et al [US 2004/0118599].

► With respect to claims 1-2, Chason et al (figs 2-6 and text [0001]-[0059])

discloses the claimed process comprising:

dispensing a polymer stress-relief layer (440, fig 4-5, text [0036]) upon a substrate lower surface under conditions to partially embed an electrical first bump (420) disposed upon the substrate lower surface, wherein dispensing the polymer stress-relief layer includes ejecting (text [0047]: *using inkjet nozzle to deposit polymer stress-relief layer/underfill layer 440 would eject a substantially continuous polymer mass upon the substrate lower surface*) a substantially continuous polymer mass (440, fig 4) upon the substrate lower surface;

curing the polymer stress-relief layer (text [0040], [0044], [0048]-[0049]);

following curing the polymer stress-relief layer, reflowing the electrical first bump (fig 5, text [0043]).

► With respect to claim 3, the dispensing the polymer stress-relief layer (440) would be dispensed in a continuous action (*the polymer stress-relief layer 440 includes continuous portion*)

► With respect to claim 4, Chason et al (fig 4) shows dispensing the polymer stress-relief layer (440) includes forming a substantially continuous stress-relief layer

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film between the electrical first bump and an electrical second bump that is spaced apart and adjacent to the electrical first bump.

► With respect to claim 5, Chason et al (fig 4) shows dispensing the polymer stress-relief layer includes forming a substantially continuous stress-relief layer film between the electrical first bump and a plurality of electrical subsequent bumps in excess of two, at least one of which is spaced apart and adjacent to the electrical first bump.

► With respect to claim 6, the dispensing the polymer stress layer (440) of Chason et al would include ejecting a substantially continuous polymer mass upon the lower surface that includes a ball grid array in excess of four electrical bumps including the electrical first bump.

► With respect to claim 27, Chason et al (figs 2-6 and text [0001]-[0059]) discloses the claimed process comprising:

dispensing a polymer stress-relief layer (440, fig 4-5, text [0036]) upon a substrate lower surface under conditions to partially embed an electrical first bump (420) disposed upon the substrate lower surface, wherein dispensing the polymer stress-relief layer includes ejecting (text [0047]: *using inkjet nozzle to deposit polymer stress-relief layer/underfill layer 440 would eject a substantially continuous polymer mass upon the substrate lower surface*) a substantially continuous polymer mass (440, fig 4) upon the substrate lower surface, wherein the polymer stress relief layer includes a polymer selected from a resin, an epoxy, a cyanate ester, a polyimide, a polybenzoxazole, a polybenzimidazole, a polybenzothiazole and a combination thereof;

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curing the polymer stress-relief layer (text [0040], [0044], [0048]-[0049]).

► With respect to claim 35, Chason et al (figs 2-6 and text [0001]-[0059]) discloses the claimed process comprising:

locating an electrical first bump (420, fig 4) upon a substrate lower surface, wherein the electrical first bump touches a peripheral ring polymer stress-relief layer (portion of polymer stress-relief layer 440 located in a region between the outer loop of bumps 420 and edges of the chip 410, see fig 4 of as attachment for details)

dispensing a polymer stress-relief layer (440, fig 4-5, text [0036]) upon a substrate lower surface under conditions to partially embed an electrical first bump (420) disposed upon the substrate lower surface;

curing the polymer stress-relief layer (text [0040], [0044], [0048]-[0049]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chason et al [US 2004/0118599] in view of Qi et al [US 6,774,497].

Chason et al substantially discloses the claimed method including dispensing the polymer stress-relief layer with a depth range against the electrical first bump. Chason

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et al does not expressly teach said depth range from about 5 percent the first height of the electrical first bump to about 95 percent the first height of the electrical first bump.

However, Qi et al teaches using the polymer stress relief layer with the depth range from about 20 to about 60 percent height of electric bump.

Therefore, at the time of invention, it would have been obvious for those skilled in the art to modify process of Chason et al by dispensing the polymer stress-relief layer with the depth range as being claimed, per taught by Qi et al, to provide device with highly reliable electrical interconnection with effective environment protection (see Qi et al, col 3 lines 10-33).

4. Claim 31, as being best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Chason et al [US 2004/0118599] in view of Tawata et al [US 5,570,506].

With respect to claim 31, the substrate lower surface of Chason et al is a mounting substrate land side. Chason et al does not expressly teach using polybenzothiazole prepolymer for forming stress-relief layer. However, polybenzothiazole prepolymer is a known material for forming stress-relief layer. Selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig-saw puzzle." 325 U.S. at 335, 65 USPQ at 301. See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960) (selection of a known plastic to make a

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container of a type made of plastics prior to the invention was held to be obvious). See Tawata et al as an evidence that shows using polybezothiazole prepolymer for forming stress-relief layer (low thermal expansivity polyimide). Therefore, at the time of invention, it would have been obvious for those skilled in the art to modify process of Chason et al by ejecting the polybezothiazole prepolymer onto the mounting substrate land side and heating the polybezothiazole prepolymer with appropriate temperature for forming the polymer stress-relief layer to provide a protection to the device.

5. Claims 32-34, as being best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Chason et al [US 2004/0118599] in view of Danvir et al [US 6,821,878].

Chason et al substantially discloses the claimed method comprising:

dispensing a polymer stress-relief layer (440, fig 4-5, text [0036]) upon a substrate lower surface under conditions to partially embed an electrical first bump (420) disposed upon the substrate lower surface, wherein dispensing the polymer stress-relief layer includes ejecting (text [0047]: *using inkjet nozzle to deposit polymer stress-relief layer/underfill layer 440 would eject a substantially continuous polymer mass upon the substrate lower surface*);

curing the polymer stress-relief layer (text [0040], [0044], [0048]-[0049]).

Chason et al does expressly teach mating the electrical first bump through a pre-applied solder flux spot on a board.

However, Danvir et al teaches mating electrical bump (420, fig 4b) through the pre-applied solder flux spot (430) on a board (450) and curing the pre-applied solder

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bump and stress-relief layer (col 12 – using heating to secure bumped array device 410 to the board 450).

Therefore, at the time of invention, it would have been obvious for those skilled in the art to modify process Chason et al by mating the electrical first bump through the pre-applied solder flux spot on the board and curing the polymer stress-relief layer and the pre-applied solder flux on the board to improve efficiency of highly reliable interconnection of the electrical first bump to the board.

6. Claims 36-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chason et al [US 2004/0118599] in view of Vanfleteren et al [US 6,555,414].

Chason et al substantially discloses the claimed method except teaching forming the polymer stress layer in a spiral/serpentine pattern.

However, Vanfleteren et al (figs 4's, cols 1-14, more particularly col 8 lines 48-67) teaches the polymer stress layer (NCA 5) can be any shape including the spiral/serpentine pattern.

Therefore, at the time of invention, it would have been obvious for those skilled in the art to modify process Chason et al by forming the polymer stress-relief layer in the spiral/serpentine pattern as a design choice to provide stress-relief function of device.

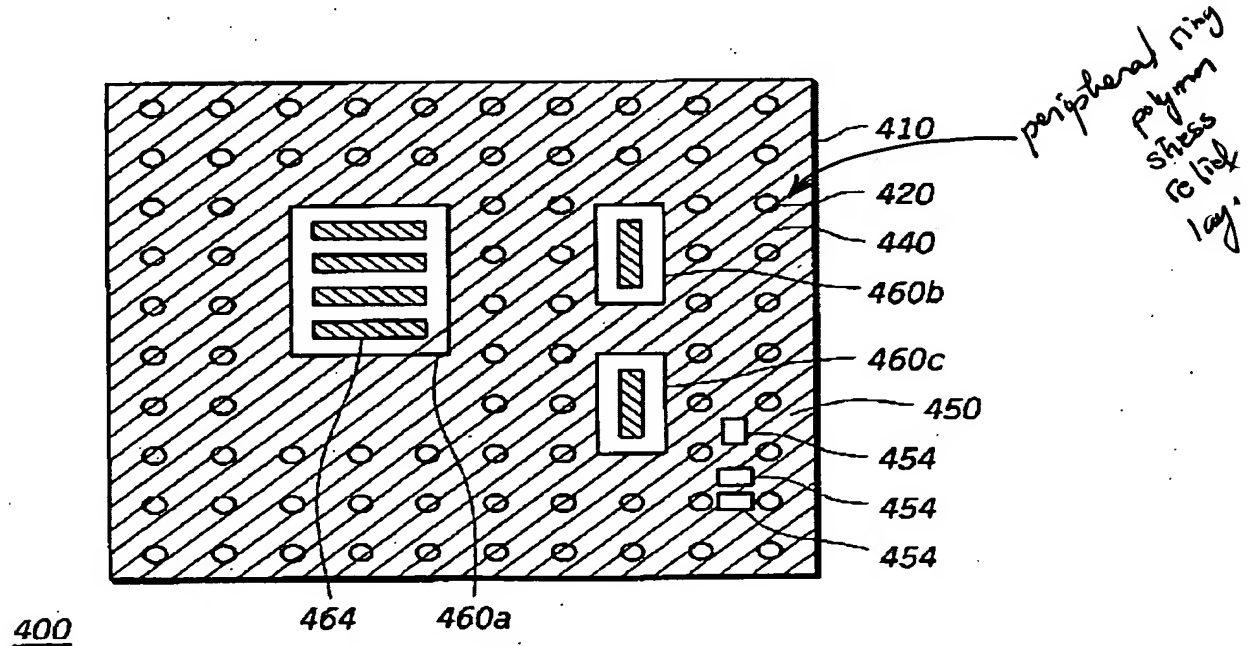
Response to Arguments

7. Applicant's arguments filed 10/12/2006 have been fully considered but they are not persuasive.

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► Contradict to Applicant's arguments on pages 6, Chason et al teaches ejecting a substantially continuous polymer mass upon a substrate by using inkjet nozzle as a dispensing technique (see Chason et al text [0047] for details)

► In regard to Applicant's argument on page 8 that Vanfletern et al does nothing to teach "peripheral ring polymer stress relief layer, argument is not persuasive since Chason et al teaches the a peripheral ring polymer stress relief layer (440, see fig 4 below). In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

**FIG. 4**

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► Contradict to Applicant's argument on page 8 regarding to 112 rejection issue, consistent claimed language should be used to clarify scope of claims. Using different or variation claimed languages to recite the same claimed element will cause confusion and unclear, especially when there are other dependent claims depend on. Appropriate corrections are respectfully suggested.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-

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1696. The examiner can normally be reached on Monday and Thursday 9:00AM - 9:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TSP

A handwritten signature in black ink, consisting of several overlapping loops and a long horizontal stroke extending to the right.

THANHHA S. PHAM
PRIMARY EXAMINER